

Confined Space Entry

Senior Safety & Loss Prevention Rep.



COURSE OBJECTIVE

Review OSHA regulations with regard to work in confined spaces



Why a Regulation?

- 670 Deaths in confined spaces during 10 year period of 1980-1989.
- 72 of the 585 separate fatal incidents involved multiple victims.



According to CDC/NIOSH report, *Worker Deaths in Confined Spaces*, Published in January of 1994. (DHHS/NIOSH # 94-103)



FYI STATS

- Average age of victims was 36
- 37% of victims were less than 30 years of age
- 66.6% of victims less than 40 years of age
- 660 victims were male
- 606 deaths due to trench cave - ins

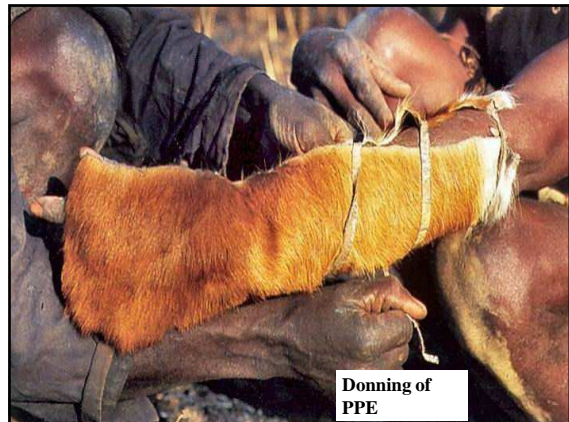


Confined Space Teamwork

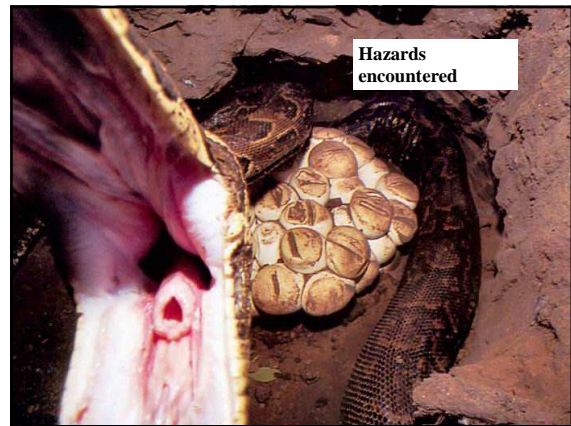
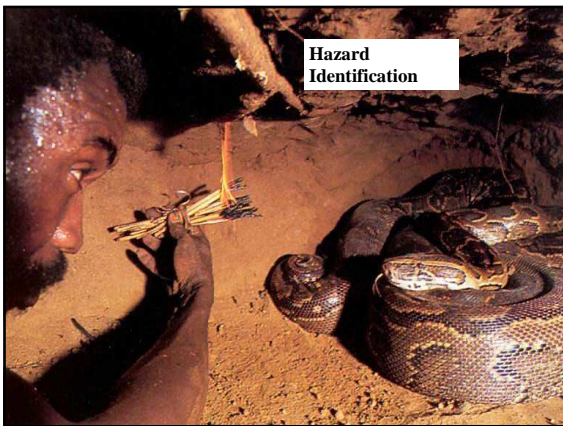
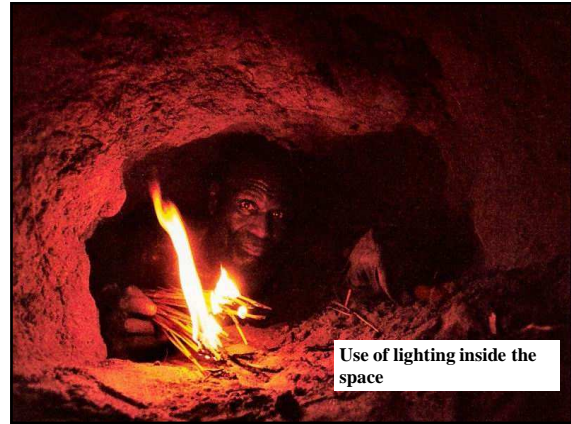
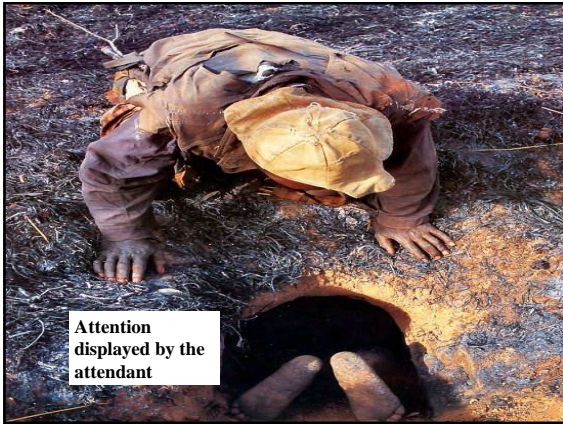
The epitome of Confined Space Entry

The attached slides show a crew accomplishing their assigned tasks on a confined space job.

Notice in the first slide the donning of PPE, then the attention displayed by the attendant, then the use of lighting inside the space, identification of the hazard, retrieval method employed, etc, etc.



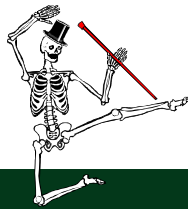
Donning of PPE





Confined Space Hazards

- Atmospheric Hazards
 - Oxygen Deficiency or Displacement
 - Explosive Atmosphere
 - Toxic Atmosphere
 - Engulfment Hazards
- Mechanical Hazards
- Electrical Hazards



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OSHA(29 CFR) 1910.146 “Permit-Required Confined Spaces”

- Applies to General Industry
- Does not apply to Agriculture, Construction or Shipyard.
 - Construction- 1926.353 and some other sections.
 - Shipyard- 1915.12, 1915.76, & 1915.94
 - Agriculture- no specific standard yet.

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Confined Space Defined:

A space that:

- (1) Is large enough that an employee can bodily enter; and
- (2) Has limited or restricted means for entry or exit; and
- (3) Is not designed for continuous employee occupancy.

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Hazards of Confined Spaces

- ✓ Atmospheric
- ✓ Physical Configuration (Chad)
- ✓ Mechanical
- ✓ Electrical
- ✓ Thermal
- ✓ Noise
- ✓ Vibration
- ✓ Engulfment or Entrapment

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Typical Confined Spaces

- ❑ Boilers & Furnaces
- ❑ Pipelines
- ❑ Pits
- ❑ Process Vessel
- ❑ Silo & Storage Tanks
- ❑ Sewer & Manholes
- ❑ Trenches & Excavations

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Three Types of Confined Spaces Covered by OSHA Rule:

- Permit-Required Confined Space
- Permit-Required Confined Space re-classified based on ability to control atmospheric hazard with ventilation
- Non Permit-Required Confined Space



Non-Permit Required Confined Space:

A space that:

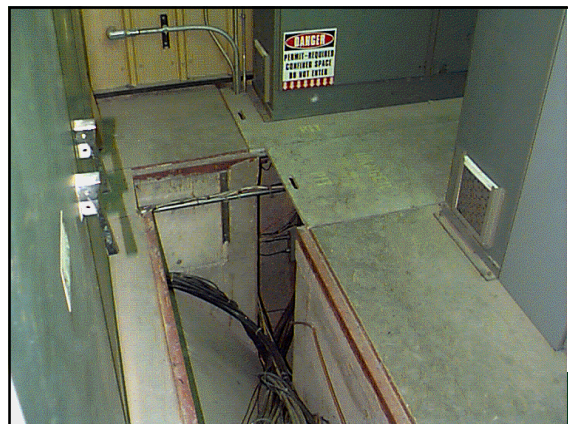
“does not contain or, with respect to atmospheric hazards, have potential to contain any hazard capable of causing death or serious physical harm.”

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Non-Permit Required Confined Space:

- ☞ Space must be evaluated to determine if hazards exist
- ☞ Documentation of evaluation
- ☞ Even with a non- permit required classification space will be tested prior to entry

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Permit Space Reclassified based on ability to control atmospheric hazard

Less Stringent Alternate Entry Procedures may be used if:

- Only hazard is actual or potential hazardous atmosphere.
- Continuous forced air ventilation makes safe.
- Monitoring and inspection data support this.
- Initial entry to collect data done according to permit-required confined space requirements.
- Monitoring and inspection data is documented and available to employees or employee's authorized representative before entry.

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Alternate Entry Procedures:

- Hazardous conditions eliminated before cover removed.
- Openings promptly guarded.
- Atmosphere tested for oxygen, flammable gases and vapors, and potential toxic air contaminants (in order specified).
- No hazardous atmosphere at any time employees are in space.

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Alternate Entry Procedures (Continued):

- Forced air ventilation
 - employee not to enter until ventilated to safe levels
 - forced air directed to ventilate immediate area where employee is or will be.
 - air supply from clean source.
- Atmosphere to be periodically tested.
- If hazardous atmosphere develops, employees to leave space immediately, cause determined, preventive measures implemented before re-entry.

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Alternate Entry Procedures (Continued):

- Employer must certify the space is safe to enter and make certification document available to employees or employees' authorized representative before entry.



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Permit-Required Confined Space Defined:

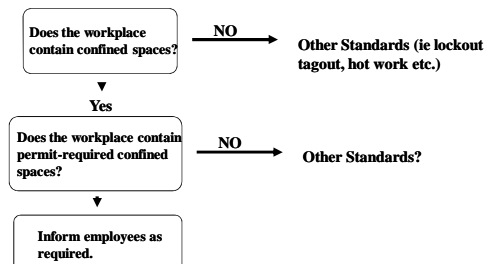
A confined space that has one or more of the following characteristics:

- (1) Potentially hazardous atmosphere;
- (2) Potential for engulfing an entrant;
- (3) Internal configuration with potential to trap or asphyxiate an entrant (i.e. inwardly converging walls, sloping or tapering floor; or
- (4) Contains any other recognized serious safety or health hazard.

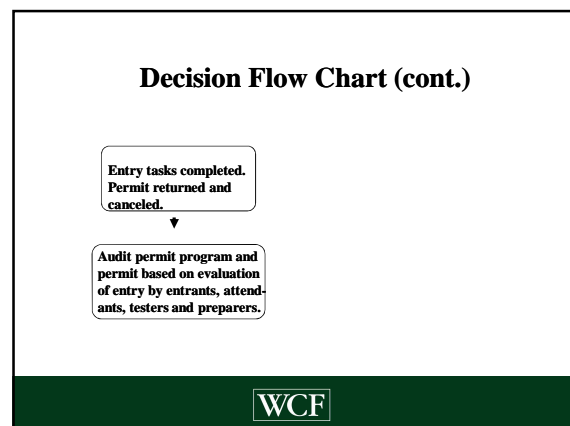
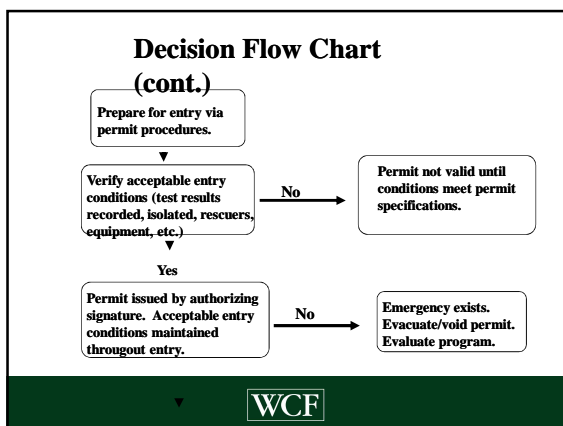
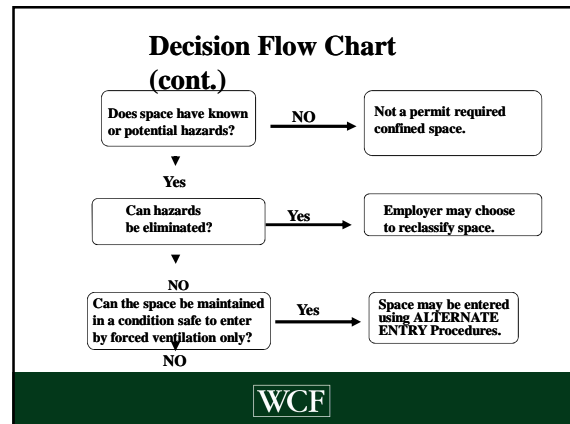
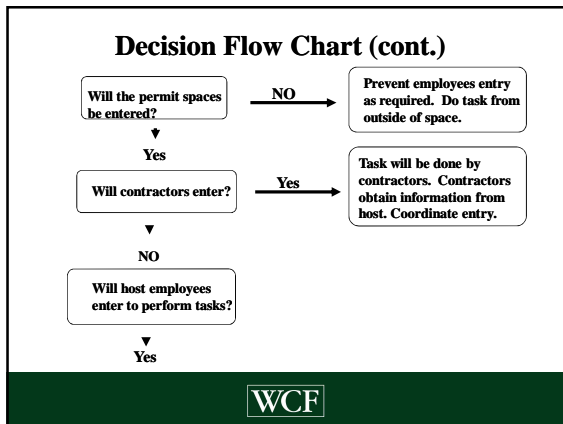
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Confined Space Decision Flow Chart



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Permit-Required Confined Space Requirements (14 Steps)

- 1. Prevent unauthorized entry.
- 2. Identify and evaluate hazards before entry.
- 3. Develop and implement procedures for safe entry.
 - Specify acceptable entry conditions.
 - Isolate space. (LO/TO, blinds or blanks)
 - Purge, inert, flush, ventilate to control atmospheric hazards.
 - Barriers to protect entrants from external hazards.
 - Verification of acceptable entry conditions throughout entry operation.

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Permit Required Confined Space Requirements (continued)

- 4. Provide equipment for:
 - Testing and monitoring atmosphere.
 - Ventilation.
 - Communications
 - Personal Protective Equipment.
 - Lighting.
 - Barriers and shields
 - Safe exit and entry.
 - Rescue and emergency
 - Other equipment needed for safe entry or exit from the space.

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Permit Required Confined Space Requirements (continued)

- 5. Evaluate permit space conditions.
 - Test atmosphere before entry, then continuously or periodically throughout entry.
 - Test first for oxygen, then combustible gases and vapors, and then for toxic gases and vapors.



Permit Required Confined Space Requirements (continued)

- 6. Provide an attendant outside permit space for duration of entry operations.
- 7. For attendants of multiple spaces, attendant should be able to respond to one or more emergencies without distraction from duties.



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Permit Required Confined Space Requirements (continued)

- 8. Designate authorized entrants, attendants, entry supervisors, and atmospheric testers.
- 9. Rescue and emergency procedures.
- 10. Permit system for preparation, issuance, use, and cancellation. (See outline of rule items (e) & (f), and example permits in Appendix D.)
- 11. Procedures for coordination of entry of multiple employers.

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Permit Required Confined Space Requirements (continued)

- 12. Procedures for closing permit space and canceling permit after entry is completed.
- 13. Review entry operations if problems arise and correct deficiencies before subsequent entries.
- 14. Review permit-required confined space program periodically (at least annually).

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Entry Permit Requirements

- 1. Permit Space to be entered
- 2. Purpose of entry
- 3. Date, Time and Duration
- 4. Authorized Entrants by Name
- 5. Name of Attendant
- 6. Signature of Entry Supervisor
- 7. Hazards Present

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Entry Permit Requirements [Continued]

- 8. Measures to Control Hazards
- 9. Acceptable Entry Conditions
- 10. Testing Results
- 11. Rescue & Emergency Information
- 12. Communication Procedures
- 13. Equipment, i.e. PPE, Testing, Comm

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Confined Space Entry Permit

Permit will remain at job site until job is complete or a new permit is issued. Expired permit must be sent to the safety office.

This permit is valid if conditions change within the confined space. Expire the confined space and do not re-enter until conditions are evaluated and a new permit issued.

Date & Time issued: _____ Expiration: _____
 Equipment ID & Location: _____
 Signature required: _____
 Entry Supervisor (if Confined Space Permit): _____
 Project Coordinator: _____ Area Supervisor: _____ Tester: _____

Special Requirements

Electrical or electrical equipment isolated (de-energized)	Y	N/A	Life/limb/emergency rescue equipment	Y	N/A
Line opened, service broken	Y	N/A	Hot work permit	Y	N/A
Safe access	Y	N/A	Lighting	Y	N/A
Means of communication (radio, etc.)	Y	N/A	Other protective equipment (list below)	Y	N/A

Personal Protective Equipment Requirements

Shovel/shield	Y	N/A	Safety net	Y	N/A
Full-body respirator	Y	N/A	Provisional safety	Y	N/A
Full-face respirator	Y	N/A	Other protective equipment (list below)	Y	N/A

Regulator Tests For Entry Conditions

Acceptable	Date	Date	Date	Date	Date	Date
% of oxygen	20.9% - 21.3%					
% of LEL (LFL)	10% or less					

Tests To Be Taken

Acceptable	Date	Date	Date	Date	Date	Date
No. of tests	1					
Carbon monoxide	50 ppm					
Sulfur dioxide	2.0 ppm (0.5% by volume)					
Hydrogen cyanide	5.0 ppm (0.5% by volume)					
Hydrogen sulfide	10 ppm					
Acetylene	0.1% (100 ppm)					
Heat stress potential	If yes, specify additional required					

Initial of tester: _____
 Instrument used: _____ Emergency # _____
 Continuous monitoring required: Y/N _____ Periodic tests required: Y/N _____ Frequency: _____
 Additional requirements: _____

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Training Requirements

- Employer to provide training to ensure understanding, knowledge, and skills necessary for safe performance of duties assigned.
- When?
 - Before assignment to confined space duties.
 - Before a change in duties.
 - When there is a change in permit space operations
 - When deviations from procedures or inadequacies in employee's knowledge are evident.



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Training Requirements (continued)

- Training must establish employee proficiency in duties
- Employer shall certify (document) training and include:
 - Employee's name.
 - Signature(s) or initials of trainer(s).
 - Dates of training.



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Duties of Authorized Entrants

- Know the hazards, modes, signs, symptoms, and consequences of exposure.
- Properly use equipment (i.e. testing, ventilation, communications, ppe, lighting, barriers/shields, equipment for safe entry and exit, and rescue and emergency equipment).
- Maintain communication with attendant (Wyo)

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Duties of Authorized Entrants (continued)

- Alert the attendant if:
 - Warning signs or symptoms are recognized during entry.
 - Any prohibited condition arises.
- Exit immediately if:
 - Attendant or entry supervisor orders an evacuation of the space.
 - Warning signs or symptoms are noted.
 - Entrant detects a prohibited condition.
 - An evacuation alarm is sounded.

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Duties of Attendant (Top 10)

- 1. Know the hazards, modes, signs, symptoms, and consequences of exposure.
- 2. Know possible behavioral effects of hazard exposure. (Jim)

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Duties of Attendant (Top 10)

- 3. Maintain accurate count of entrants in the space.
- 4. Remain outside permit space unless relieved by another authorized attendant.

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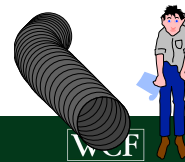
Duties of Attendant (continued)

- 5. Maintains communication with entrants.
- 6. Monitors activities inside and outside the space and order evacuation if:
 - Prohibited condition is detected.
 - Behavioral effects of exposure to hazard are detected in entrants.
 - A situation outside the space to threaten safety of entrants is detected.
- 7. Summon rescue and emergency services.

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Duties of Attendant (continued)

- 8. Prevent unauthorized entry.
- 9. Perform non-entry rescue.

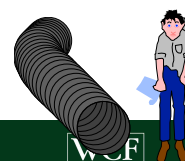


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Duties of Attendant (continued)

- 10. Perform no duty that may interfere with primary duty to monitor and protect entrants.



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Duties of Entry Supervisor (7)

- 1. Know the hazards, associated modes, signs, symptoms, and consequences of exposure.
- 2. Verify and sign permit .
- 3. Terminate entry and cancel permit when work is complete or prohibited conditions arise.
- 4. Verify availability of rescue services and means to summon them.

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Duties of Entry Supervisor (continued)

- 6. Remove unauthorized persons who enter or attempt to enter space.



- 7. Ensure that entry operations remain consistent with terms specified on permit and acceptable entry conditions are maintained.

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Rescue & Emergency Services

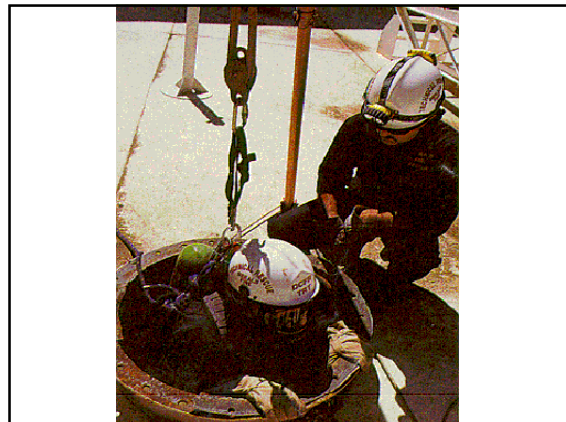
- Employer's Responsibilities:
 - Evaluate rescuer's ability to respond in timely manner.
 - Evaluate rescuer's proficiency with rescue-related tasks and equipment.
 - Select a rescue team or service that has capability to reach victims within a timeframe appropriate to the hazards, and that is equipped for and proficient in performing the needed rescue services.
 - Inform rescue service of hazards of the site.
 - Provide access to rescue service in order to develop appropriate rescue plans.

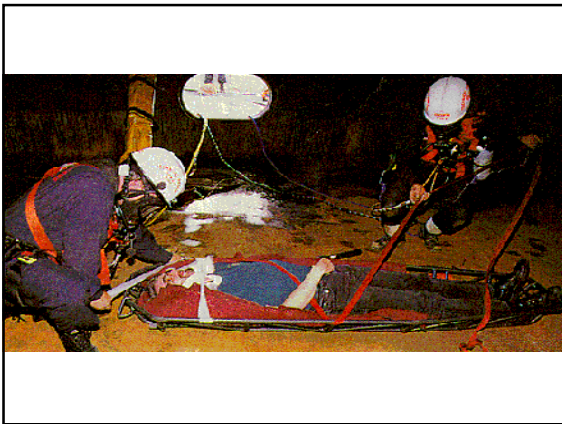
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Rescue & Emergency Services (continued)

- Rescue Service Employer's Responsibilities:
 - Provide PPE needed to conduct permit space rescues, and train to ensure proficiency in use.
 - Train rescue employees to perform rescue duties and same training as authorized entrants (as in paragraph g & h of the standard).
 - Train rescue employees in basic first aid and CPR
 - Ensure rescue employees practice making permit space rescues at least once every 12 months by means of simulated rescue operations.

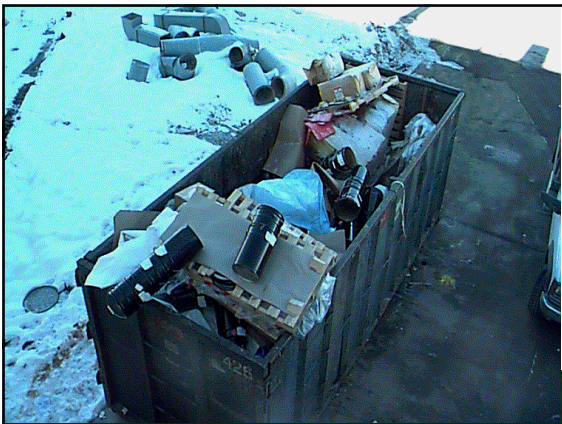
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**Are They or Aren't
They Confined
Spaces?**

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Remember the Definition of Confined Space

- Large enough to bodily enter.
- Limited means of entry/exit.
- Not intended for continuous human occupancy.



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Questions?

For more information contact your safety representative or call 288-8105 or Toll Free 1-800-446-COMP ext. 8105

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Thank You!

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Mike Brown, MPH
Workers Compensation Fund

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Atmospheric Testing

- Know your equipment.
- Calibrate instrument before use.
- Know the potential atmospheric hazards.
- Test in specified order.
- Document!

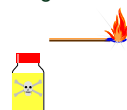


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Atmospheric Testing (See Appendix B of 1910.146)

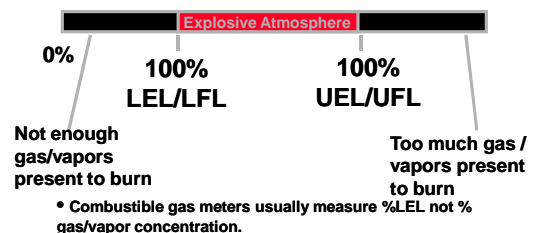
• Test In Specified Order:

1. Oxygen
 - 19.5% to 23.5%
2. Flammable and combustible gases and vapors.
 - Less than 10% LFL/LEL
3. Toxic gases and vapors
 - Within Permissible Limits



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LEL/LFL and UEL/UFL: Lower Explosive Limit and Upper Explosive Limit



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Flammable Range

	F.R.
Acetylene	2.5 - 81%
Hydrogen	4.0 - 74%
Methane	4.0 - 14%
Propane	2.2 - 9.5%
Benzene	1.2 - 7.8%

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Flammable Range vs. Percent LEL

	50% LEL	F.R.
Acetylene	?	2.5 - 81%
Hydrogen	?	4.0 - 74%
Methane	?	4.0 - 14%
Propane	?	2.2 - 9.5%
Benzene	?	1.2 - 7.8%

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% LEL/LFL -VS- Toxic % Concentration

Example: Toluene

1.1% Concentration = 100% LEL

0.11 % Concentration = 10% LEL for Toluene

0.11% Concentration of Toluene = 1100 ppm

OSHA PEL for Toluene = 200 ppm TWA

300 ppm Ceiling

500 ppm IDLH

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Testing For Stratified Atmospheric Hazards

- All levels should be tested
- 4 feet in direction of travel of tester and to each side.
- Allow enough time for instrument readings to stabilize.

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